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with any of the great European telescopes. This is probably on account of the unfortunate fact that the LICK Observatory telegrams were seriously changed during transmission, and the observers were led to expect the satellite at elongation at wrong times. However, it is probable that sufficient observations will have been obtained during the opposition upon which to base a thorough investigation of the orbit. E. S. H.

DR. GILBERT ON THE EVOLUTION OF THE MOON.

[At a meeting of the National Academy of Sciences, held at Baltimore, November, 1892, Dr. G. K. GILBERT, of the U. S. Geological Survey, presented a memoir on the Evolution of the Moon. An abstract of this paper is given in the *American Naturalist* for December, and is reprinted below. In this connection the reader should refer to these *Publications*, Volume IV, p. 37, where an observation of Dr. GILBERT'S on a crater in Arizona is described. This crater was actually formed by a falling meteor. So far as I know, Dr. GILBERT is the first geologist of high standing to give his authority to the hypothesis that lunar craters have, *in general*, been formed by the bombardment of the lunar surface by meteorites. My own studies on Moon photographs do not lead me to the same conclusion. I hope that some of the selenographers of the Society, Messrs. WEINEK, ELGER, RANYARD and others, may be willing to treat this question in the *Publications*.—E. S. H.].

"Dr. GILBERT said in part: 'The surface of the Moon, like that of the Earth, is diversified by plains, uplands and mountains, and these various features have special characters in which they differ from those of the Earth. The plains lie lower than other portions of the surface, and are distinguished by their darker color. By those who have mapped the surface of the Moon they are called seas, but the word is used in a figurative sense, for it is well understood that there is no water on the Moon. The mountains are usually in the form of rings, each ring inclosing a hollow, and to this form the name crater is given. They are scattered over the surface of the plains, and on the uplands they are thickly set, overlapping one another in every variety of relation. They are of all sizes, from the smallest that the telescope can discern to a diameter of several hundred miles. Those of medium and larger size are usually characterized by a smooth circular plain in the interior and a hill or group of hills rising in the center of the plain. They differ from the craters of the Earth in various ways, especially in the fact that their bottoms are below the level of the surrounding country, and in the fact that the central hill bears no crater on its summit.

" 'The origin of these craters has been the subject of many theories. Despite their marked peculiarities of form, they have more commonly been ascribed to volcanic action; but they have also been referred to the bursting of gigantic bubbles, to the evaporation of water and its accumulation about the point of evaporation, as ice, and to the impact of bodies from without. Personally, I favor the last mentioned explanation, but I differ from other writers in respect to the origin of the colliding bodies. It has been previously surmised that these might be rocks hurled from terrestrial volcanoes; that they might be meteors from the recesses of space, such as are continually burned in the upper layers of our atmosphere, giving rise to shooting stars, and that they might be aggregates of such meteors constituting balls of cosmic dust. Now, my idea of their origin is based upon the phenomena of the planet *Saturn* and its ring. About that planet is a disc-like ring which astronomers believe to be constituted of an indefinitely large number of very small bodies revolving about the planet in parallel orbits — a symmetrically shaped form of small satellites. Assume that a similar ring of minute satellites once encircled the Earth, and that those gradually became aggregated into a smaller number of larger satellites, and eventually into a single satellite—the Moon. The craters mark the spots where the last of the small bodies collided with the surface when they finally lost their independence and joined the larger body.' "

DISCOVERY OF ASTEROIDS BY PHOTOGRAPHY.

The remarkably rapid advance made in many lines of astronomical research since the introduction of dry-plate photography is nowhere more marked than in the discovery of the asteroids. *Ceres*, the first of the small planets, was discovered the first day of this century, and a few years later three others were found. A fifth was not added until 1847; but since then they have been searched for systematically, with wonderful patience, by PETERS, WATSON, PALISA, and many other noted astronomers. One year ago the number had reached 322. No. 323 was discovered photographically by Dr. WOLF, of Heidelberg, and in the past year he has detected twelve other new planets on his plates. A single negative recorded four planets, two new ones and two previously discovered. CHARLOIS, of Nice, discovered two by visual methods early this year; but later he adopted the photo-